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ELECTROLUMINESCENCE PACKAGING STRUCTURE
[Erekutororuminessensu no toritsuke kouzou]

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[Claim]

[Claim 1] An electroluminescence packaging structure characterized by: retaining the edge parts of electroluminescence, which was formed by sequentially layering a transparent electrode, a light-emitting layer, a dielectric layer, and a backplate under the bottom side of a transparent substrate and by covering them with an insulating film, by means of "コ"-shaped vibration insulating members; and by adhering and fixing at least one of the top sides or bottom sides of said vibration insulating members to a fixing base body by means of an adhesive.

[Detailed Explanation of the Invention]

[0001] [Technical Field of the Invention]

The present invention relates to an electroluminescence mounting structure which prevents noises in an electronic apparatus equipped with electroluminescence.

[0002] [Related Art]

Electroluminescence (hereafter referred to as EL) is employed for backlights that are used as nighttime illuminations for liquid-crystal panels of electronic appliances such as portable clocks and cell phones. In general, this EL has the structure illustrated in Figure 5. In other words, in the structure of the EL [1], a transparent electrode [3], a light-emitting layer [4], a dielectric layer [5], and a backplate [6] are layered in that order under the bottom face of a transparent substrate [2], and these are covered by an insulating film [7]. Moreover, although not illustrated, parts of the transparent electrode [3] and backplate [6] are extended to the outer rim, and these extended end parts are provided

with terminals for voltage application.

[0003] As the transparent substrate [2] making up the above EL [1], a material such as glass, a PET (polyethylene terephthalate) film, etc. that has excellent transparency, insulation properties, humidity resistance, etc. is utilized. Moreover, the transparent electrode [3] is formed by vacuum-depositing ITO (indium tin oxide) powder obtained by doping indium oxide (In_2O_3) with tin oxide (SnO_2). Moreover, a light-emitting layer [4] is formed by dispersing light-emitting powder, which is obtained by doping zinc sulfate (ZnS) that acts as a light-emitting base material with a small amount of an activating agent (metal or halogen element), into a high dielectric resin binder, such as a cyano resin compound, and by then applying a printing method, etc. Moreover, the dielectric layer [5] is formed by dispersing a high dielectric metal, such as barium titanate, into a high dielectric resin binder and by then applying a printing method. This dielectric layer [5] also has a reflecting function because of the barium titanate. Moreover, the backplate [6] is formed by turning silver powder or graphite powder into a paste and by then applying a printing method. Furthermore, the insulating film [7] is formed from a resin, such as a fluorocarbon resin, that has excellent humidity resistance and insulating properties by means of printing or is formed by bonding a resin film with the transparent substrate [2] by means of thermocompression.

[0004] When a predetermined AC voltage is applied to the transparent electrode [3] and backplate [6] of the thus-formed EL [1] through the application terminal equipped at the extended end parts, the

light-emitting layer [4] emits light, which becomes radiated to the exterior through the transparent electrode [3] and transparent substrate [2] and illuminates the surrounding area brightly.

[0005] Moreover, one of the conventional structures, in which an EL having the above structure is used as the backlight of a liquid-crystal panel, is illustrated in Figure 6. In other words, according to this structure, the liquid-crystal panel [8] is fixated to a retaining frame [9], and the EL [1] placed on the lower-face side of the liquid-crystal panel [8] is fixated to a fixing base body [10] by means of an adhesive [11]. In this case, the retaining frame [9] is formed from a relatively rigid material such as a metal plate or plastic plate and is integrally attached to the chassis, printed circuit board, etc. of the electronic apparatus. As the fixing base body [10], the printed circuit board or a metal plate provided specifically for fixation is utilized.

[0006] Based on the above structure, the light emitted by the EL [1] illuminates the liquid-crystal panel above it and thus brightly lights up the display in the dark during nighttime, etc.

[0007] However, vibrations occur when the EL [1] emits light and become transmitted to the fixing base body [10] and then further to the periphery components that are in contact with the fixing base body [10]. As a result, a resonance phenomenon occurs and appears as vibration noises. In a cell phone, in particular, it appears as noises that interfere with conversations.

[0008] As a method for solving this noise problem, there is the technique disclosed in Kokai No.10-215085. According to this structure

illustrated in Figure 7, an EL [1] is fixated by the edges of the bottom face of the EL [1] being adhered to a fixating base body, which is a printed circuit board [10], by means of a rectangular-frame-shaped sponge foam [12] equipped with both-sided tapes [12a], and a liquid-crystal panel [8] is fixated above the EL [1] by using a retaining frame [9] attached to the printed circuit board [10].

[0009] In this case, the sponge foam [12] is utilized as a vibration insulator that inhibits vibrations, and it dampens the vibrations transmitted to the printed circuit board [10] by absorbing the vibrations of the EL [1]. In this manner, the effect of inhibiting noises is achieved.

[0010] [Problems that the Invention is to Solve]

However, in order to realize such a structure, the vibration insulator, which is the sponge foam, needs to be disposed on the side on which the fixing base body is fixated. Therefore, the vibration insulator's installation direction must be distinguished based on whether the EL is fixated at the top side or bottom side. Moreover, the shape of the vibration insulator needs to be changed in some cases. Furthermore, it costs to shape the sponge foam into a rectangular frame, and the shape must be made to match the size of the EL if the size is altered. Moreover, if the EL needs to be replaced during repair, etc., the vibration insulator must be peeled off, which makes repairing troublesome.

[0011] [Means for Solving the Problems]

The present invention was completed in light of the above problems, and its purpose is to supply a structure in which the EL can be optionally fixated at either one of the top side or bottom side by means of a single

type of vibration insulating members. In order to achieve this purpose, the present invention is characterized by: forming an electroluminescence by sequentially layering a transparent electrode, a light-emitting layer, a dielectric layer, and a backplate under the bottom side of a transparent substrate and by covering them with an insulating film; retaining the edge parts of said electroluminescence by means of コ-shaped vibration insulating members; and by adhering and fixing at least one of the top sides or bottom sides of said vibration insulating members to a fixing base body by means of an adhesive.

[0012] [Embodiment of the Invention]

An EL packaging structure of the invention will be explained based on the following drawings. Figures 1 ~ 2 illustrate the EL packaging structure of a first embodiment of the invention. Figure 1 is its cross-sectional drawing, and Figure 2 is a plane view of the EL of Figure 1 viewed from the top. Moreover, members in the drawing identical to those of the related art have been assigned the same reference numerals.

[0013] According to the EL packaging structure of this embodiment shown in Figure 1, an EL [1] is sandwiched and fixated by コ-shaped vibration insulating members [21] which are provided in an opposing manner in the drawing. Moreover, the bottom faces [21b] of the opposing vibration insulating members [21] are adhered and fixated to a fixing base body [10].

[0014] The vibration insulating members [21] have the shapes of コ, and the EL [1] is retained by the edge parts [1b] of the EL [1] being

locked with the depressed spaces [21a] of the ⊐ shapes. Moreover, these vibration insulating members [21] have certain lengths and retain the edge parts [1b] of the four sides of the EL [1], which is roughly rectangular. For these vibration insulating members [21], a soft material such as rubber or a resin is selected, and they absorb the vibrations of the EL [1] and inhibit the transmission of vibrations to the fixing base body [10]. Soft silicon rubber is utilized in this embodiment. A projection part [1a] provided at a portion of the edges of the roughly rectangular EL [1] is a terminal attaching part, to which a voltage application terminal is equipped, and it is preferred that the vibration insulating members [21] be provided in a manner such that they retain the edge parts of the four sides as widely as possible except for the terminal attaching part.

[0015] Next, although a printed circuit board is utilized directly as the fixing base body [10] in this embodiment, it is not particularly specified and may instead be a relatively rigid metal sheet.

[0016] In the above structure, light emitted from the EL [1] becomes transmitted through a liquid-crystal cell [8] above it and illuminates the display of the liquid-crystal cell [8].

[0017] Moreover, vibrations generated from the EL [1] become absorbed by the soft vibration insulating members [21], and the transmission of vibrations to the fixing base body [10] is suppressed as a result. Thus, generation of noise is prevented.

[0018] Moreover, since the EL [1] can be attached by simply being inserted into the depressed parts [21a] on the inner sides of the ⊐-shaped vibration insulating members [21], which are attached to the fixing base

body [10] along the four sides of the EL [1], its attachment and removal can be performed with ease and replacing it during repair, etc. is almost trouble-free.

[0019] Moreover, since the edge parts [1a] on the four sides of the EL [1] are retained by コ-shaped vibration insulating members [21], a spatial gap [23] is created automatically between the EL [1] and the fixing base body [10], and the air layer of this spatial gap [23] also acts to suppress the transmission of the vibrations of the EL [1]. This creates another noise preventing effect.

[0020] Moreover, even if the size of the EL [1] is altered, it is only required to adjust the lengths of the コ-shaped vibration insulating members [21] in accordance with the size of the EL [1]. Since they can be easily cut into desired lengths, only one type of vibration insulating members is necessary. Therefore, it is not necessary to prepare different vibration insulating members for different sizes of EL as in the past, and the cost can therefore be low.

[0021] Moreover, the EL [1] is roughly a rectangle in this embodiment, but a round-shaped one can be applied in the same manner. If the shape is circular, a vibration insulating member is formed in a round ring shape and is provided with a depressed コ-shaped part on its inner-diameter side. This ring-shaped vibration insulating member should be used after being divided into 2 or 3 sections.

[0022] Next, Figure 3 is a cross-sectional drawing of an EL packaging structure pertaining to a second embodiment of the invention. In this embodiment, the lower face of a liquid-crystal panel [8] fixated to a

retaining frame [9] are adhered and fixated to the upper faces [21c] of the opposing コ-shaped vibration insulating members [21] by means of an adhesive [22], and the edge parts [1b] of an EL [1] is inserted into the depressed parts [21a] on the inner sides of the コ shapes of the opposing vibration insulating members [21].

[0023] In this embodiment, the EL [1] is packaged by the upper faces [21c] of the コ-shaped vibration insulating members [21] being directly adhered to the lower faces of the liquid-crystal panel [8]. In this case, the liquid-crystal panel [8] is used as both a display and a fixing base body.

[0024] In this manner, combined with the above-described first embodiment, the EL can be packaged by means of the adhesion and fixation of both upper and lower sides of a single type of コ-shaped vibration insulating members. Therefore, the EL can be packaged by means of a single type of vibration insulating members regardless of the packaging direction of the EL. Therefore, there is also an advantage in terms of cost.

[0025] Moreover, by employing a structure in which the EL is sandwiched by コ-shaped vibration insulating members, vibrations of the EL are absorbed and thus prevented from being transmitted to the fixing base body. Not only that, a certain spatial gap is created between the EL and the fixing base body, and the air layer in this spatial gap inhibits the vibrations of the EL. These two effects correlatively amplify the effect of noise prevention.

[0026] Next, Figure 4 is a cross-sectional drawing showing an EL structure of a third embodiment. In this embodiment, an EL [1] is sandwiched by opposing コ-shaped vibration insulating members [21]. The lower faces [21b] of the vibration insulating members [21] are adhered and fixated to a fixing base body [10] by means of an adhesive [22], and the upper faces [21c] of the vibration members [21] are adhered and fixated to a liquid-crystal panel [8] by means of the adhesive [22].

[0027] As described earlier, the above packaging structure can be employed by utilizing コ-shaped vibration insulating members, and conventionally used retaining frames for liquid-crystal panels become unnecessary. This also has a cost reducing effect.

[0028] As described earlier, by employing a structure in which an EL is sandwiched by コ-shaped vibration insulating members, the EL can be attached to either of the upper side or lower side of the fixing base body by means of a single-type of vibration insulating members. Therefore, vibrations of the EL are suppressed, and a noise preventing effect is achieved. Moreover, the same vibration insulating effect can be achieved by fixating the EL to the depressed parts of the vibration insulating members by means of an adhesive instead.

[0029] [Effects of the Invention]

As explained in detail earlier, by sandwiching an EL by means of コ-shaped vibration insulating members as in the structure of this invention, it becomes possible to attach the EL to either one of the upper side or lower side of the fixing base body by means of a single type of

vibration insulating members.

[0030] Moreover, by employing a structure in which an EL is sandwiched by コ-shaped vibration insulating members, vibrations can be suppressed by the vibration insulating members. Not only that, a spatial gap is automatically created between the EL and the fixing base body, and the air layer in the spatial gap also inhibits vibrations. Therefore, the noise preventing effect can be amplified.

[0031] Moreover, when コ-shaped vibration insulating members are utilized, the EL can be attached by being simply inserted into the depressed parts of the コ shapes. Therefore, it can be attached and detached swiftly with ease.

[0032] Moreover, when using a rectangular-shaped EL, the vibration insulating members can be used after having their lengths adjusted by being severed. Therefore, only one type of vibration insulating members is necessary, and there is no need to prepare various types of them to match the size of the EL. This reduces the cost as a result.

[Brief Explanation of the Drawings]

[Figure 1] A cross-sectional drawing showing the EL packaging structure of a first embodiment of the invention.

[Figure 2] A plane view of the EL of Figure 1 viewed from the top.

[Figure 3] A cross-sectional drawing showing the EL packaging structure of a second embodiment of the invention.

[Figure 4] A cross-sectional drawing showing the EL packaging structure of a third embodiment of the invention.

[Figure 5] A cross-sectional drawing showing an EL structure.

[Figure 6] A cross-sectional drawing showing a packaging structure of EL utilized as the backlight of a conventional liquid-crystal panel.

[Figure 7] A cross-sectional drawing showing a conventional EL packaging structure for noise prevention.

[Explanation of the Reference Numerals]

[1] = EL

[1b] = edge part

[2] = transparent substrate

[3] = transparent electrode

[4] = light-emitting layer

[5] = dielectric layer

[6] = backplate

[7] = insulating film

[10] = fixing base body

[21] = コ-shaped vibration insulating member

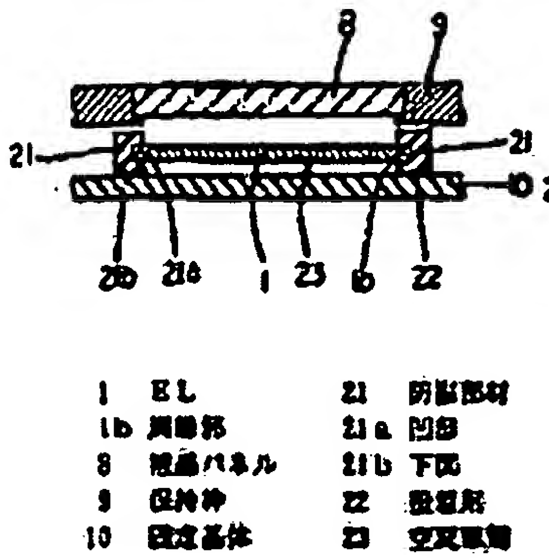
[21a] = depressed part

[21b] = lower face

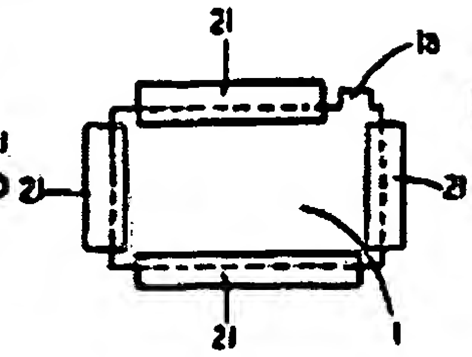
[21c] = upper face

[22] = adhesive

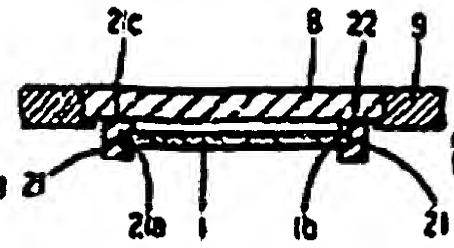
[Figure 1]



[Figure 2]



[Figure 3]



[Figure 5]

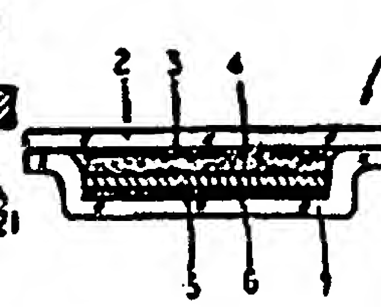


Figure 7

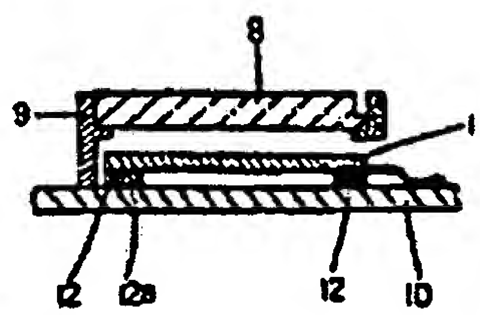


Figure 4

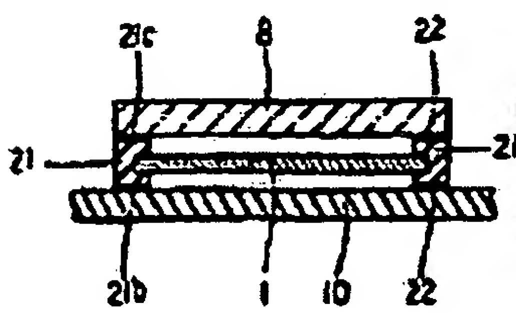
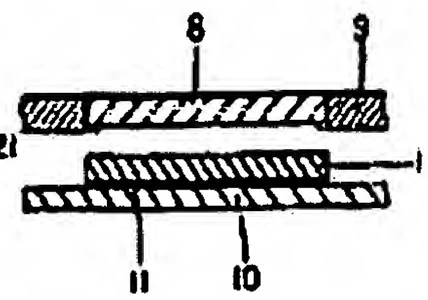


Figure 6



[1] = EL; [1b] = edge part; [8] = liquid-crystal panel; [9] = retaining frame; [10] = fixing base body; [21] = コ-shaped vibration insulating member; [21a] = depressed part; [21b] = lower face; [22] = adhesive; [23] = spatial gap.